PUBLICATIONS.

Die Entstehung der Blei-, Zink- und Eisenerzlagerstätten in Oberschlesien. Eine Besprechung von H. Höfer. Separatabdruck aus der "Oesterreichischen Zeitschrift für Berg- und Hüttenwesen." XLI. Jahrgang, 1893.

This very interesting paper is itself a review of three publications by Küntzel, Fr. Bernhardi and Rich. Althans, which were presented at the Breslau meeting of the Verein der Allegemeinen Deutschen Bergmanstage, all treating of the ore deposits of Upper Silesia.

These important deposits, from which have been derived by far the greater part of Germany's zinc output, are briefly and excellently described by Althans, as follows:

"The ores of the Upper Silesian Muschelkalk[1] are principally galena, zinc-blende, smithsonite, marcasite and limonite. These occur in bed-like deposits in the dolomite of the Lower Muschelkalk, the beds being usually more or less connected. Generally two beds, or deposits at two different horizons, can be distinguished: one immediately above what is known as the Sohlenstein and separated from it only by a bed of slate known as Vitriolletten, or by a layer of dolomite which is seldom over one or two meters thick; the other in the mass of the dolomite at a very variable distance above the first. The upper one is of much more irregular distribution than the lower; in the Trockenberg basin it is indeed almost entirely absent. Both are in part purely lead-bearing, but they are then rarely more than a meter thick, and at the same time are much interrupted; in part they are predominantly zinc-bearing, and in this case they are much thicker and occur more frequently as continuous beds. The lead-bearing beds belong principally to the Trockenberg basin, the zinc-bearing almost exclusively to Beuthen. In both, the whole thickness is not of compact ore, but this is almost always intermixed with dolomite, which, in fact, generally makes up the mass of the ore body. Where the deposits are zinc-bearing, the lower portion consists mostly of zinc-

[1] Lower Triassic.

blende, together with sulphide of iron and galena; the upper part consists almost exclusively of the so-called red calamine, that is, a ferruginous, zinciferous dolomite, with some galena. The dolomite, which occurs both below and above as well as *in* the lower blende-bearing beds, has almost always the original bluish gray color, whereas in proximity to the upper portion it is more or less decomposed.

"Towards the outcrop the deposits of the two principal horizons unite and form a body that in places is as much as twenty meters thick. Here it consists principally of the red calamine with galena. The ore often extends also down into the Sohlenstein, along crevices and pipes, in which case it is more clayey. In the extremities of these openings the iron contents also disappear, so that the ore passes into a white calamine (a dolomite rich in $ZnCo_3$)."

The three publications referred to include maps and descriptions of the ore deposits, and discussions of their genesis. Höfer considers principally the last, analyzing and comparing the different hypotheses in a very interesting manner.

Thus, Bernhardi maintains the hypothesis that, after the deposition of the basal Sohlenstein formations, rich solutions of zinc, lead and iron salts were introduced into the Triassic sea, from which they were precipitated either by CO_2 or H_2S, which were evolved in abundance from the then recently formed and underlying coal beds. The ore deposition was most abundant where these gases were generated in greatest quantities.

Bernhardi bases his conclusions upon the fact that the zinc deposits are developed in the Muschelkalk only where there are well-developed coal formations beneath, and especially where such outcropped in the floor of the Triassic sea. Höfer calls attention to the deposits of Tarnowitz as an exception, and remarks, very truly, that this condition is equally favorable to the hypothesis of infiltration as to that of original deposition.

In further support, Bernhardi cites the facts that there are no evidences in the underlying Coal Measures or in the Sohlenstein that the ores have come from below, and, further, that faults of the Coal Measures either do not extend into the Muschelkalk or have very little throw there. These facts Höfer classes also as equally favoring infiltration.

Against the latter hypothesis Bernhardi instances the stratum like form of the ore deposit, and the unaltered or unoxidized condition of the dolomite which is associated with the sulphides. Höfer does not

think these objections valid. The stratified form, he argues, might readily be due to the impermeability of the Sohlenstein, which would cause the waters to flow along the contact between it and the permeable dolomite above, while the carbonaceous Vitriolletten bed would precipitate the ores. The unoxidized condition of the dolomites and clays does not mean necessarily that no waters traversed them, but merely that these waters had no air or free acids in solution. Such could well have been exhausted, says Höfer, in oxidizing the sulphides of the higher strata, before transporting them to the present ore horizons. Further, Höfer reasons, on the hypothesis of sedimentation, beds of dolomite and limestone would have been deposited in alternate layers in the ore body, as they were before and after. Not only is this not the case, but Bernhardi describes a brecciated structure which sometimes characterizes the greater part of the deposit, where blocks of dolomite are cemented by the ore. This condition, as well as the presence of vertical and other ore-bearing crevices in the dolomite, is incompatible with a sedimentary origin of the ores. Hence, Höfer thinks, this hypothesis must be abandoned.

Althans, in discussing the source of the ores, shows that Krug von Nidda's explanation, that the solutions came from below through pipes or chimneys, will not hold, because when such pipes have been followed into the Sohlenstein they have always come to an end.

Against Dr. Kostmann's hypothesis, that the solutions came from the interior through crevices or fissures, are the facts that the fissures of the Coal Measures almost never extend into the Triassic; that there are no deposits in the underlying bituminous Sohlenstein, and that no such source of supply has been encountered or is indicated in mining operations. Höfer, therefore, discards also the hypothesis of ascending solutions.

The remaining alternatives are defined as follows:

1. The metals were originally diffused in the sedimentary complex overlying the Sohlenstein and subsequently leached out and deposited at the present ore horizon.

2. The ore deposits were originally concentrated sediments which acquired their present forms by subsequent rearrangements and changes.

The first of these hypotheses was advanced long ago by Carnall, and was accepted by Websky, Runge, Römer and others. These older authors referred to the dolomite alone as the source of the ore, and

Carnall estimates that 0.0008 per cent. of galena in this rock would suffice to supply the ore deposits. Such a minute quantity, it is argued, might well escape detection in the analysis of limestone; but, Höfer remarks, even the absence of the metals in the dolomites at present is no objection, since they have been already leached out. Althans thinks it highly probable that not only the dolomite but also the Upper Muschelkalk and Keuper beds, and even others lying higher contain diffused metals and were sources of supply to the ore deposits. But Höfer thinks this improbable because of impervious beds in the Keuper and also at the base of the Upper Muschelkalk.

In conclusion, Höfer sees no unanswerable objection to the explanation of the origin of the ores by descension and infiltration.

The second alternative hypothesis was advanced by an anonymous G. W. in 1883. It resembles somewhat Chamberlin's hypothesis applied to the Wisconsin ores, though the causes and conditions of original concentration are somewhat different and the degree of concentration somewhat greater than Chamberlin requires.

Höfer evidently favors this explanation, without distinctly saying so, but confines himself to the conservative statement that it deserves more consideration. Against Althan's objection that such enormous metalliferous deposits could not be precipitated directly from sea water, he refers to the iron deposits of the southern shore of the Oberen Sea and to the Rammelsberg copper deposits. The sea water of past ages can well have had, he argues, higher metalliferous contents, seeing that so much has now been extracted to form our ore bodies. The abundance of carbonaceous matter at the beginning of the dolomite formation would cause an excessive if not entire precipitation of the metal contents of the sea water. As the bituminous Vitriolletten became covered this would diminish. The dolomite being throughout somewhat bituminous a constant separation of metals in small quantities probably continued, sufficient to impregnate the rock and to account for the scattered occurrences of ore found in it. The alteration of the original deposits to their present forms must have taken place later, after oxidizing influences began to act. Höfer considers this hypothesis simpler, in that it does away with the necessity for the transportation by infiltration of metalliferous salts, and the whole open question of their solubilities is eliminated.

After briefly reviewing similar ore deposits of other parts of Europe, our author concludes that they cannot be better explained than on the

hypothesis that the strata were ore-bearing at the time of their formation, and that the metals were derived from sea water.

This paper is well worthy of study by American geologists. Whether the explanations are applicable to any of the similar ore deposits of this country or not, the discussions are full of suggestion, and are instructive examples of conservative reasoning.

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Fragments of Earth Lore. By JAMES GEIKIE, D.C.L., LL.D., F.R.S., *etc.* 428 pp, 6 plates. John Bartholomew & Co., Edinburgh.

This volume contains a series of essays and addresses, most of which have been published elsewhere. Many of them have appeared in the Scottish Geological Magazine, while some have appeared in other publications which are less accessible to American readers. The scope of the volume is indicated by the following titles which serve as the headings of as many chapters: Geology and Geography; The Physical Features of Scotland; Mountains, their Origin, Growth, and Decay; The Cheviot Hills; The Long Island, or outer Hebrides; The Ice Age in Europe and North America; The Intercrossing of Erratics in Glacial Deposits; Recent Researches in the Glacial Geology of the Continent; Glacial Period and the Earth-movement Hypothesis; The Glacial Succession in Europe; The Geographical Evolution of Europe; The Evolution of Climate; The Scientific Results of Dr. Nansen's Expedition; The Geographical Development of Coast Lines.

As will be seen by the titles, the several chapters have no intimate relation to each other, though most of them deal with geographic phases of geology. Each chapter is complete in itself. While some of the essays deal with phenomena which are local, all of them deal with principles which are more or less general in their nature, and many of them deal with phenomena which are of universal interest. The subjects are treated in a way which is popular without being unscientific. A service is rendered to students and teachers of geology in collecting and presenting the essays in a single volume, which should find a place in every geological and geographical library. The untechnical language of the essays will make the book available for